

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (currently amended) A swept slotted three-dimensional airfoil having a span and a predetermined three-dimensional shape tailored to improve transonic performance over an un-slotted airfoil, the airfoil comprising:

at least one leading airfoil element having an upper surface and a lower surface;

at least one trailing airfoil element defining a full-span transonic cruise slot with the leading airfoil element, the trailing airfoil element having an upper surface and a lower surface, the slot being positioned spanwise along the span at a position where the airfoil experiences Mach critical flow and having a predetermined three-dimensional shape to allow a portion of the air flowing along the lower surface of the leading airfoil element to diverge to flow over the upper surface of the trailing airfoil element and, thereby, to provide the performance improvement, wherein the slot location substantially coincides with the shock location.

2. (original) A swept aircraft wing comprising the airfoil of claim 1.

3. (original) The wing of claim 2, wherein the slot includes an aerodynamically smooth channel defined between the leading and trailing airfoil elements without an unfaired cove.

4. (previously presented) The wing of claim 2, wherein the slot is configured to improve performance of the wing by at least one criterion selected from:

an increase in cruise speed;

an increase in lift;

an increase in thickness;
a reduction in sweep;
a reduction in drag; or
a combination thereof.

5. (previously presented) The wing of claim 2, wherein the slot extends spanwise along the wing where airflow separation would occur to add drag during a transonic condition of the wing.

6. (original) The wing of claim 2, wherein the slot is configured to push shock waves generated by supersonic flow across the wing to a position further aft on the wing.

7. (original) The wing of claim 2, wherein the slot is configured to increase the drag-divergence Mach number capability of the wing while at least maintaining a comparable aerodynamic efficiency for the wing.

8. (original) The wing of claim 2, wherein the slot is configured to mitigate shock waves and provide a higher cruise speed for the wing.

9. (original) The wing of claim 2, further comprising an actuator structure coupled to the leading and trailing airfoil elements for moving one of the leading and trailing airfoil elements relative to the other element to trim the slot.

10. (previously presented) The wing of claim 9, wherein the actuator structure is configured to trim the slot by at least one action selected from:

adjusting a gap separating the leading and trailing airfoil elements, the gap defining the slot;

adjusting a relative height between the leading and trailing airfoil elements;

adjusting an angle between the leading and trailing airfoil elements; or

a combination thereof.

11. (currently amended) ~~The wing of claim 2,~~ A swept aircraft wing comprising a swept slotted three-dimensional airfoil having a span and a predetermined three-dimensional shape tailored to improve transonic performance over an un-slotted airfoil, the airfoil comprising:

at least one leading airfoil element having an upper surface and a lower surface;

at least one trailing airfoil element defining a full-span transonic cruise slot with the leading airfoil element, the trailing airfoil element having an upper surface and a lower surface, the slot being positioned spanwise along the span at a position where the airfoil experiences Mach critical flow and having a predetermined three-dimensional shape to allow a portion of the air flowing along the lower surface of the leading airfoil element to diverge to flow over the upper surface of the trailing airfoil element and, thereby, to provide the performance improvement, and

an actuator structure coupled to the leading and trailing airfoil elements for moving at least one of the leading and trailing airfoil elements relative to the other element,

wherein the slot includes a plurality of segments longitudinally arranged along the wing, each of the segments being independently adjustable by the actuator structure to allow trimming of the slot differently at different locations along the span.

12. (original) The wing of claim 2, further comprising an actuator structure coupled to the leading and trailing airfoil elements for moving one of the leading and trailing airfoil elements relative to the other element to close the slot during at least one subsonic condition and to open the slot during the transonic condition.

13. (previously presented) The wing of claim 2, wherein the slot is defined during at least one transonic condition of the wing selected from at least one of a cruise condition and a maneuver.

14. (original) The wing of claim 2, wherein:

the leading airfoil element comprises a main wing portion;

the trailing airfoil element comprises a flap; and

the wing further comprises an actuator structure for trimming the flap during cruise to improve performance of the wing during cruise.

15. (original) An aircraft comprising the airfoil of claim 1.

16. (currently amended) A method for flying a slotted aircraft wing having a predetermined three-dimensional shape tailored to improve transonic performance over an un-slotted wing, a span, at least one leading airfoil element, and at least one trailing airfoil element defining at least one full-span transonic cruise slot with the leading airfoil element, the slot being positioned along the span at a position where the wing experiences Mach critical flow and such that the slot location substantially coincides with the shock location, the slot having a predetermined three-dimensional shape to allow a portion of the air flowing along a lower surface of the leading airfoil element to diverge to flow over the upper surface of the trailing airfoil element and, thereby, to provide the performance improvement, the method comprising trimming the slot during a transonic condition so as to achieve a performance improvement in the transonic condition.

17. (previously presented) The method of claim 16, wherein the transonic condition is selected from at least one of a cruise condition and a maneuver.

18. (original) The method of claim 16, wherein:

the leading airfoil element comprises a main wing portion;

the trailing airfoil element comprises a flap assembly; and

trimming the slot comprises actuating the flap assembly.

19. (previously presented) The method of claim 16, wherein trimming the slot comprises at least one action selected from:

adjusting a gap separating the leading and trailing airfoil elements, the gap defining the slot;

adjusting a relative height between the leading and trailing airfoil elements;

adjusting an angle between the leading and trailing airfoil elements; or
a combination thereof.

20. (original) The method of claim 16, further comprising closing the slot during at least one subsonic condition of the wing.

21. (original) The method of claim 16, wherein the slot includes an aerodynamically smooth channel defined between the leading and trailing airfoil elements without an unfaired cove.

22. (currently amended) A method for flying a swept slotted aircraft wing defining at least one full-span transonic cruise slot positioned along the span at a position where the wing experiences Mach critical flow and such that the slot location substantially coincides with the shock location, the slot having a predetermined three-dimensional shape tailored to improve transonic performance over an un-slotted wing, the method comprising using the full-span slot to divert a portion of the air flowing along a lower surface of the wing to flow over an upper surface of the wing during at least one transonic condition of the wing, the diverting at least delaying airflow separation that would occur to add drag at the transonic condition so as to achieve a performance improvement in the transonic condition.

23. (original) The method of claim 22, further comprising trimming the slot during the transonic condition.

24. (previously presented) The method of claim 23, wherein trimming the slot comprises at least one action selected from:

- adjusting a gap separating a leading element and a trailing element, the gap defining the slot;

- adjusting a relative height between the leading element and the trailing element;

- adjusting an angle between the leading element and the trailing element;

or

- a combination thereof.

25. (previously presented) The method of claim 24, wherein:

- the leading airfoil element comprises a main wing portion;

- the trailing airfoil element comprises a flap assembly; and

- trimming the slot comprises actuating the flap assembly.

26. (original) The method of claim 22, further comprising opening the slot when at or near the transonic condition.

27. (original) The method of claim 22, further comprising closing the slot during at least one subsonic condition of the wing.

28. (original) The method of claim 22, wherein the slot includes an aerodynamically smooth channel defined between the leading and trailing airfoil elements without an unfaired cove.

29. (currently amended) A method for flying a slotted aircraft wing having a predetermined three-dimensional shape tailored to improve transonic performance over an un-slotted wing, a span, a main wing portion, and a flap assembly defining at least one full-span transonic cruise slot with the main wing portion during cruise, the slot

being positioned along the span at a position where the wing experiences Mach critical flow and such that the slot location substantially coincides with the shock location, the slot having a predetermined three-dimensional shape to allow a portion of the air flowing along a lower surface of the leading airfoil element to diverge to flow over the upper surface of the trailing airfoil element and, thereby, to provide the performance improvement, the method comprising actuating the flap assembly during cruise to trim the flap assembly so as to achieve a performance improvement during cruise.

30. (original) The method of claim 29, wherein the slot includes an aerodynamically smooth channel defined between the leading and trailing airfoil elements without an unfaired cove.

31-38. (cancelled)

39. (new) The wing of claim 9, wherein the slot includes a plurality of segments longitudinally arranged along the wing, each said segment being independently adjustable by the actuator structure to allow trimming of the slot differently at different locations along the span.

40. (new) The wing of claim 11, wherein the slot extends spanwise along the wing where airflow separation would occur to add drag during a transonic condition of the wing.

41. (new) The wing of claim 11, wherein the slot is configured to push shock waves generated by supersonic flow across the wing to a position further aft on the wing.

42. (new) The wing of claim 11, wherein the slot is configured to increase the drag-divergence Mach number capability of the wing while at least maintaining a comparable aerodynamic efficiency for the wing.

43. (new) The wing of claim 11, wherein the slot is configured to mitigate shock waves and provide a higher cruise speed for the wing.

44. (new) The method of claim 16, wherein the slot includes a plurality of segments longitudinally arranged along the wing, and wherein trimming the slot includes independently adjusting each said segment to trim the slot differently at different locations along the span.

45. (new) The method of claim 23, wherein the slot includes a plurality of segments longitudinally arranged along the wing, and wherein trimming the slot includes independently adjusting each said segment to trim the slot differently at different locations along the span.

46. (new) The method of claim 29, wherein the slot includes a plurality of segments longitudinally arranged along the wing, and wherein the method includes independently adjusting each said segment to trim the slot differently at different locations along the span.